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Division of Air Quality Control

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING

DIVISION OF AIR QUALITY CONTROL

1982

AIR QUALITY DATA REPORT

ONE WINTER STREET - 8TH FLOOR
BOSTON, MASSACHUSETTS 02108

GOVERNMENT DOCUMENTS
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I. INTRODUCTION

This report presents 1982 annual air quality data for Massachusetts collected by the Division of Air Quality Control (DAQC), Department of Environmental Quality Engineering (DEQE). Data is collected by the Commonwealth and submitted to the U.S. Environmental Protection Agency (EPA) for inclusion into the National Aeromatic Data Bank in accordance with Regulations 40 CFR 58. DAQC has primary responsibility for measuring ambient air quality to verify compliance with state and national standards (see Table 1), to support development of regulations designed to reduce ambient air contaminants, to assess the effectiveness of existing air pollution control strategies, and to fulfill EPA reporting requirements for air quality data.

The continuous air monitoring stations are located in a variety of areas within Massachusetts, both urban and rural. The stations are equipped with air pollution monitoring equipment (see Table 3) and, in some cases, meteorological equipment. The state air pollution monitors record levels of ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, nitrogen oxide, oxides of nitrogen, total suspended particulates, and lead. Meteorological parameters measured in most instances include wind speed, wind direction, and temperature.

The Commonwealth's ambient air monitoring network is complemented by a private network of monitors. This private network is limited to sulfur dioxide, windspeed, wind direction, sulfate and total suspended particulate monitoring.

TABLE 1

STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING INTERVAL	PRIMARY STANDARD ug/m3	PRIMARY STANDARD ppm	SECONDARY STANDARD ug/m3	SECONDARY STANDARD ppm
Sulfur Dioxide	Annually	80	0.03	-	-
	24 hour	365	0.14	-	-
	3 hour	-	-	1,300	0.5
Particulate Matter	Annually	75	-	60**	-
	24 hour	260	-	150	-
Carbon Monoxide	8 hour	10*	9	10*	9
	1 hour	40*	35	40*	35
Ozone	1 hour	240	0.12	240	0.12
Nitrogen Dioxide	Annually	100	0.05	100	0.05
Lead	3 month	1.5	-	1.5	-

ug/m^3 - micrograms per cubic meter
ppm - parts per million

*mg/m^3 - milligram per cubic meter

** annual average is considered a guideline

TABLE 2

HEALTH AND WELFARE EFFECTS OF AIR POLLUTANTS

POLLUTANTS AND THEIR SOURCES	HEALTH EFFECTS	WELFARE EFFECTS
Ozone Product of reactions of motor vehicle exhaust, industrial process emissions and other fossil fuel combustion emissions in the presense of sunlight.	Causes difficulty in breathing, especially when exercising, irritates eyes, may result in an increased susceptibility to respiratory infection.	Toxic to plants by causing both leaf damage and a decrease in growth. Can weaken materials such as rubber and fabrics.
Total Suspended Particulates Fossil fuel burning, industrial process emissions, motor vehicle exhaust, traffic movement over dusty roads.	Cause further distress to those with chronic lung diseases, can alter the lungs natural cleansing mechanism and can either be composed of or have toxic materials adhered to the surface.	Cause soiling of materials, are corrosive and can damage buildings. In addition, cause haze which reduces visibility and the amount of solar energy reaching the earth.
Carbon Monoxide Internal combustion engines, fossil fuel combustion, and cigarette smoking.	Reduces the blood's ability to carry oxygen which may cause heart and brain damage. Causes a decreased exercise capacity in those with angina pectoris. Also can cause slowed physical reactions, dizziness, fatigue, and headache.	No known effect on materials or vegetation.
Sulfur Dioxide Combustion of fossil fuel.	Irritation of throat and lungs and aggravation of symptoms among those with chronic lung diseases.	Corrosion and deterioration of metals, brittleness of paper, discoloration of paint and deterioration of fabric. Causes leaf damage to some plants.
Nitrogen Dioxide Emitted from motor vehicles and fossil fuel burning operations such as power plants.	Aggravation of symptoms in those with asthma and chronic bronchitis and increased susceptibility to respiratory infections	Fading of dyes, yellowing of leaves on plants, and changing the horizon to a reddish brown color.

TABLE 3

ANALYSIS COLLECTION METHOD LISTING*

Sulfur Dioxide:
- 14 Coulometric
- 20 Pulse Flourescent Instrumental

Carbon Monoxide:
- 11 Non-Dispersive Infra-Red Instrumental
- 14 Ultraviolet Photometric

Ozone:
- 11 Chemiluminescent Instrumental

Nitrogen Dioxide:
- 14 Chemiluminescence Instrumental

Total Suspended Particulates:
- 92 High Volume Air Sampler

Lead:
- 92 High Volume Air Sampler

* Corresponds To Data Summary: Instrument Method

Figures 2, 3, 4, 5, and 6 present the Commonwealth's monitoring network maintained by DAQC in 1982 for each of the five pollutants. This year the Division collected a total of 388,282 hourly samples at the state-operated sites and 716,372 hourly samples at the privately-operated sites, making a total of 1,104,654 (see Figure 1). This total represents an increase of 262,955 hourly samples over those collected in 1981. The Commonwealth data has been summarized in this report for public record for information purposes. Violations of air quality standards were recorded for ozone and carbon monoxide, both for the one-hour and eight-hour averages (see Table 4). For further information pertaining to this report or other air quality-related matters, please contact either the Division of Air Quality Control in Boston at (617)292-5630 or the appropriate Regional Office.

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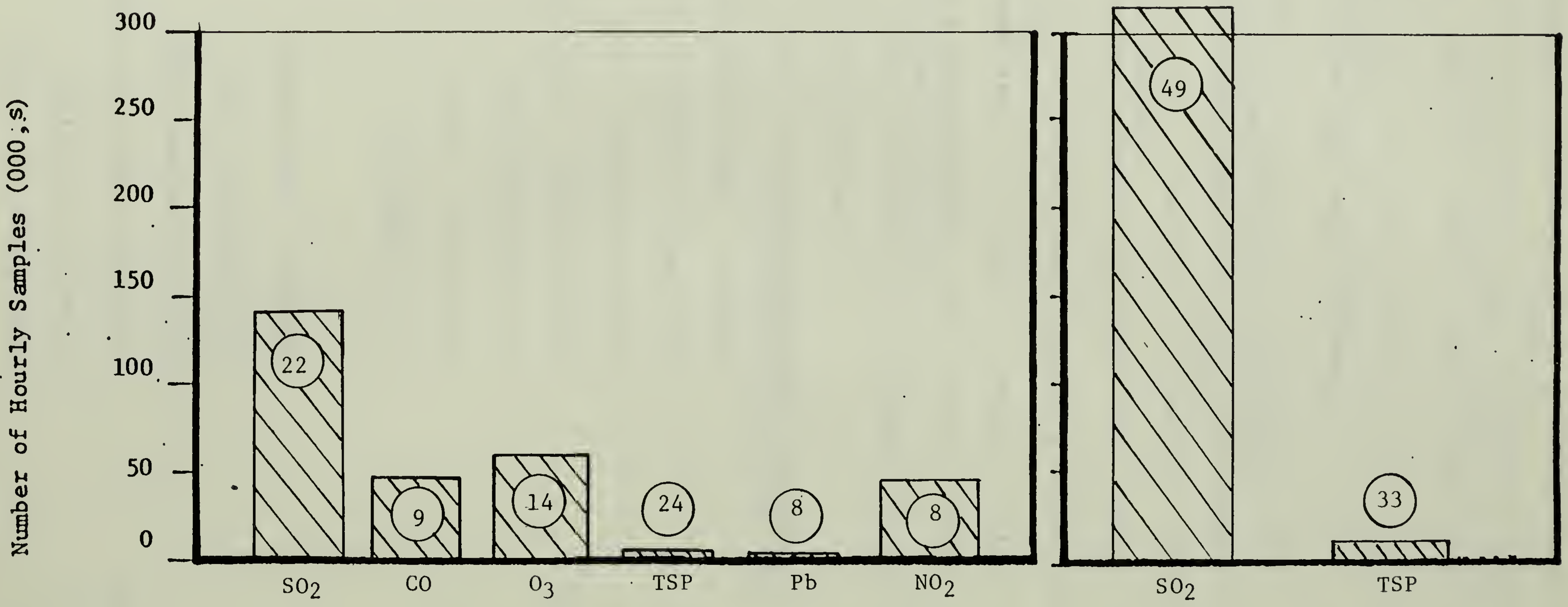
Continuous Air Sampling Network

- 1982 -

*GRAND TOTAL = 696,036



KEY

(xx) = Number of Sites

SO_2 = Sulfur Dioxide

CO Carbon Monoxide

TSP = Total Suspended Particulates

O_3 = Ozone

Pb = Lead

NO_2 = Nitrogen Dioxide

* does not include data collected for wind speed, wind direction, nitrogen oxides and sulfates, temperature and oxides of notrogen.

STATIONS VIOLATING NATIONAL AMBIENT AIR QUALITY PRIMARY STANDARDS

POLLUTANT	LOCATION	AQCR	ADDRESS	SAROAD #	MONTH	DAY	TIME	LEVEL REACHED
SULFUR DIOXIDE (SO_2) (Annual)	NO EXCEEDANCES RECORDED							
CARBON MONOXIDE(CO) (Eight hour average)	Boston	Met. Boston	Kenmore Square	0240-002	Nov.	17	11 PM	12 mg/m_3
	Boston	Met. Boston	Kneeland Street	0240-015	Nov.	17	11 PM	13 mg/m_3
					Oct.	6	11 PM	11 mg/m_3
	Boston	Met. Boston	340 Breman Street	0240-021	Nov.	17	2 AM	11 mg/m_3
	Boston	Met. Boston	Essex Street	0240-022	May	23	10 AM	10 mg/m_3
					May	23	6 PM	29 mg/m_3
					May	24	2 AM	19 mg/m_3
					May.	28	1 AM	11 mg/m_3
					Jul.	20	3 PM	11 mg/m_3
					Jul.	21	9 PM	13 mg/m_3
					Aug.	26	2 PM	10 mg/m_3
					Aug.	26	10 PM	10 mg/m_3
					Aug.	29	3 PM	10 mg/m_3
					Sept.	1	3 PM	10 mg/m^3
					Sept.	29	5 PM	10 mg/m^s
					Oct.	14	2 PM	10 mg/m^3
					Oct.	14	10 PM	10 mg/m^3
					Oct.	25	1 PM	10 mg/m^3
					Oct.	26	1 PM	10 mg/m^3
					Oct.	28	1 PM	10 mg/m^3
					Oct.	28	9 PM	13 mg/m^3
					Oct.	29	1 PM	11 mg/m^3
					Nov.	17	11 PM	11 mg/m^3
					Nov.	29	12 PM	10 mg/m^3
(One hour average)	Boston	Met. Boston	Essex Street	0240-022	May	24	1 PM	42 mg/m_3
					May	24	12 AM	38 mg/m_3

TABLE 4 (Cont.)

8/10/84

NITROGEN DIOXIDE (NO_2)	NO EXCEEDANCES RECORDED							
OZONE (O_3	Agawam	Pioneer Valley	South Westfield St.	0030-003	July	17	5 PM	.130 ppm
	Boston	Met. Boston	Breman Street	0240-021	July	16	1 PM	.145 ppm
	Easton	Met. Boston	Post Office, 300 Main Street	0535-001	July	15	12 AM	.150 ppm
					July	17	3 PM	.151 ppm
	Hamilton	Met. Boston	Bld. 9, Sagamore Hill	0795-001	July	16	2 PM	.156 ppm
					July	17	11 AM	.165 ppm
	Medfield	Met. Boston	No. Meadow Street	1210-001	July	17	5 PM	.127 ppm
	Sprngfld	Pioneer Valley	Fernbank Street	2160-014	July	7	2 PM	.155 ppm
					July	15	1 PM	.137 ppm
					July	17	5 PM	.160 ppm
	Sudbury	Met. Boston	Watertown Road	2196-001	April	25	4 PM	.153 ppm
					July	15	11 AM	.147 ppm
					Sept.	12	1 PM	.138 ppm
	Ware	Pioneer Valley	Route 32	2360-001	July	17	5 PM	.165 ppm
					July	7	4 PM	.162 ppm
					July	15	1 PM	.145 ppm
					July	6	4 PM	.130 ppm
	Worcester	Central Mass.	Belmont Avenue	2640-019	July	17	5 PM	.125 ppm

II. 1982 SITE DIRECTORY

CITY SITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO_2	CO	O_3	NO_2	TSP	Pb
	BERKSHIRE AIR QUALITY CONTROL REGION									
Pittsfield East St. (Pittsfield. Incinerator)	1800-005	647923 4701385	11	Rural- Industrial	X		X			
Pittsfield Berkshire Commons (roof of Berkshire Commons)	1800-006	643500 4699897	11	Center City Commercial					X	
Pittsfield Birchgrove Drive	1800-007	646480 4700620	3	Suburban- Commercial	X				X	
	CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION									
Fitchburg Summer St. Substation (Fitchburg Gas & Electric Co.)	0620-003	271500 4716800	5	Center City- Industrial	X					
Fitchburg 655 Main St. (Fitchburg Gas & Electric Co.)	0620-006	269900 4718200	11	Center City- Commercial					X	
Gardner 95 Pleasant Street(City Hall)	0720-003	254100 4717700	11	Center City- Residential					X	
Warren River St. (Quaboag Reg. School)	2372-001	732000 4677900	5	Rural- Agricultural					X	

II. 1982 SITE DIRECTORY

CITY SITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO_2	CO	O_3	NO_2	TSP	Pb
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION										
Boston 590 Commonwealth Ave. (Kenmore Sq Site)	0240-002	327100 4690400	5	Center City- Commercial	X	X		X		X
Boston Southampton St. (Fire Hdqtrs.)	0240-012	329580 4688230	14	Center City- Commercial					X	
Boston 68 Central Street	0240-013	331903 4693212	3	Center City- Residential					X	
Boston Kneeland Street (State Parking Lot)	0240-015	330000 4690000	3	Center City-	X	X				
Boston 340 Breman St. (Substation)	0240-021	333000 4693550	3	Center City- Residential	X	X	X	X		
Boston Essex Street	0240-022	330100 4690750	3	Center City- Commercial		X				
Boston Morrissey Blvd. (Savin Hill Yacht Club)	0240-023	331500 4686950	5	Center City- Residential	X					
Boston 200 Columbus Ave. (Fire Station Rooftop)	0240-024	329400 4690350	10	Center City- Commercial					X	
Boston Deer Island	0240-026	337900 4690200	4	Suburban- Residential	X			X		
Brockton Crescent Street	0320-003	333300 4660400	14	Center City- Industrial					X	
Chelsea Chestnut and Sixth Street	0380-002	332500 4695100	16	Center City- Commercial					X	X

II. 1982 SITE DIRECTORY

ITY ITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO_2	CO	O_3	NO_2	TSP	Pb
aston Post Office, 300 Main Street North Easton	0535-001	327050 4659170	5	Rural- Near Urban			X			
amilton Bldg. 9, Sagamore Hill (Air Force Sta.)	0795-001	351150 4721200	13	Rural- Near Urban			X			
edfield North Meadow St. (Rt. 27, Medfield State Hospital)	1210-001	307200 4675800	24	Rural- Commercial	X		X		X	
edford 100-120 Main St. (Fire Headqtrs.)	1220-002	326300 4697990	7	Center City- Commercial					X	
uincy Hancock Street (Atlantic Fire Station)	1880-007	332400 4682100	3	Suburban- Residential					X	
omerville Powder House Blvd Tufts University	2100-003	326500 4696550	5	Suburban- Residential	X	X	X	X		
udbury Water Town Road (Great Meadows Nat'l Wildlife Reserve)	2196-001	303350 4695100	5	Rural- Agricultural			X			
atertown Victory Field	2380-005	320310 4693500	4	Center City- Residential	X	X	X	X		
oburn Woburn St. & Montvale Ave. (Middlesex Cty. Court)	2620-002	323000 4705000	12	Suburban- Commercial					X	

II. 1982 SITE DIRECTORY

CITY SITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED					
					SO_2	CO	O_3	NO_2	TSP	Pb
PIONEER VALLEY AIR QUALITY CONTROL REGION										
Agawam Market Square (City Hall)	0030-003	692120 4659040	3	Rural-Agricultural			X			
Chicopee 939 Chicopee St.	0400-005	697900 4673400	4	Center City-Industrial	X	X				
Holyoke 1 Court Square (Top of District Court House)	0860-007	697480 4674500	12	Center City-Commercial					X	
Springfield 1586 E. Columbus Avenue	2160-007	698000 4662000	7	Center City-Industrial		X				X
Springfield Longhill Avenue (Substation)	2160-009	700000 4661928	6	Center City-Commercial	X					
Springfield 59 Howard Street (Howard St. School)	2160-011	699460 4663380	19	Center City-Commercial					X	X
Springfield Fernbank Street	2160-014	707080 4668200	4	Suburban-Commercial	X	X	X	X		
Springfield Community/Tech. College	2160-015	700000 4664500	15	Center City-Residential	X				X	
Ware Route 32(Ware High School)	2360-001	725850 4680900	4	Suburban-Commercial			X			
West Springfield Van Deene St. (Fire Dept. Headqtrs.)	2475-003	696400 4663940	7	Suburban-Commercial					X	

II. 1982 SITE DIRECTORY

CITY SITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC. HGT. (M)	STATION TYPE	POLLUTANTS SAMPLED SO_2	 CO	 O_3	 NO_2	 TSP	 Pb
Worcester 419 Belmont St. (Worcester HD corner of Belmont St and Lake Ave.)	2640-013	272400 4683700	5	Center City Residential					X	
Worcester 2 Washington St. (Worcester YMCA Bldg.)	2640-016	269100 4682200	13	Center City-Commercial				X	X	X
Worcester Central and Summer Sts. (Main Post Office)	2640-017	269100 4682800	8	Center City-Commercial	X					
Worcester Grove Street(Voc. Tech. Sch.)	2640-018	269100 4683750	10	Center City-Commercial					X	
Worcester Belmont Avenue (DPW Yard)	2640-019	272300 4683800	4	Center City Residential	X		X	X		
Worcester Thomas Street (Fire Station)	2640-020	269200 4683100	3	Center City-Commercial	X	X				
MERRIMACK VALLEY AIR QUALITY CONTROL REGION										
Lawrence 1 General St. (Lawrence General Hospital)	1000-003	324000 4730500	23	Center City-Commercial					X	
Lawrence High Street (Storrow Park)	1000-005	342220 4730590	4	Center City-Residential	X		X	X	X	
Lowell 35 YMCA Drive	1080-006	310370 4722640	7	Center City-Commercial					X	X
Lowell Merrimack Street (Old City Hall)	1080-007	310400 4723800	5	Center City-Commercial	X					

II. 1982 SITE DIRECTORY

CITY SITE LOCATION	SAROAD # DIST. #	UTM COORD EAST NORTH	REC HGT (M)	STATION TYPE	POLLUTANTS SAMPLED SO_2	CO	O_3	NO_2	TSP	Pb
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION										
Attleboro So. Main St. (Fire Station)	0120-002	311000 4644000	5	Center City-Residential	X				X	
Attleboro 947 Park St. (LaSalette Shrine)	0120-003	312200 4644300	11	Suburban-Commercial	X		X			
Fairhaven Leroy Wood School	0570-002	343300 4610800	4	Suburban-Residential	X		X			
Fall River 165 Bedford St. (Central Fire Station)	0580-001	321000 4618000	15	Center City-Commercial					X	
Fall River Globe Street	0580-004	319700 4616900	5	Center City-Commercial	X					
Taunton 88 Washington St. (Morton Hospital)	2240-001	326400 4641200	20	Center City-Commercial					X	

III. SAMPLING RESULTS FOR CONTINUOUS DATA

A. Sulfur Dioxide

1. Sampling Method

Two instrumental methods are used to analyze continuous sulfur dioxide concentrations: pulse fluorescent and flame coulometry. In the pulse fluorescent method, SO_2 molecules are excited by ultra-violet light. In the process, the molecules emit distinctive light waves which vary in intensity according to the SO_2 concentration. The intensity is then measured to find specific SO_2 concentrations. Flame coulometry is similar to pulse fluorescent except that a flame is used instead of ultra-violet light. Both methods meet the equivalency requirements published by the U.S. Environmental Protection Agency (EPA) in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

In 1982, there were 22 state-operated SO_2 monitors--an increase of four monitors from 1981. Eighteen of these sites operated in 1981. Of the 10 monitors that operated in both years with data capture rates greater than or equal to 75%, the annual arithmetic means at two sites were unchanged, at four sites increased, and at four sites decreased (see Table 5). There were no recorded violations of the National Ambient Air Quality Standards (NAAQS)for SO_2 in 1982. A Wilcoxon Signed Rank Test of the annual arithmetic mean indicated no statistically significant increases in annual ambient concentrations. Table 5 shows that the highest annual average is in the Metropolitan Boston urban area.

TABLE 5

3. 1982 SULFUR DIOXIDE SUMMARY

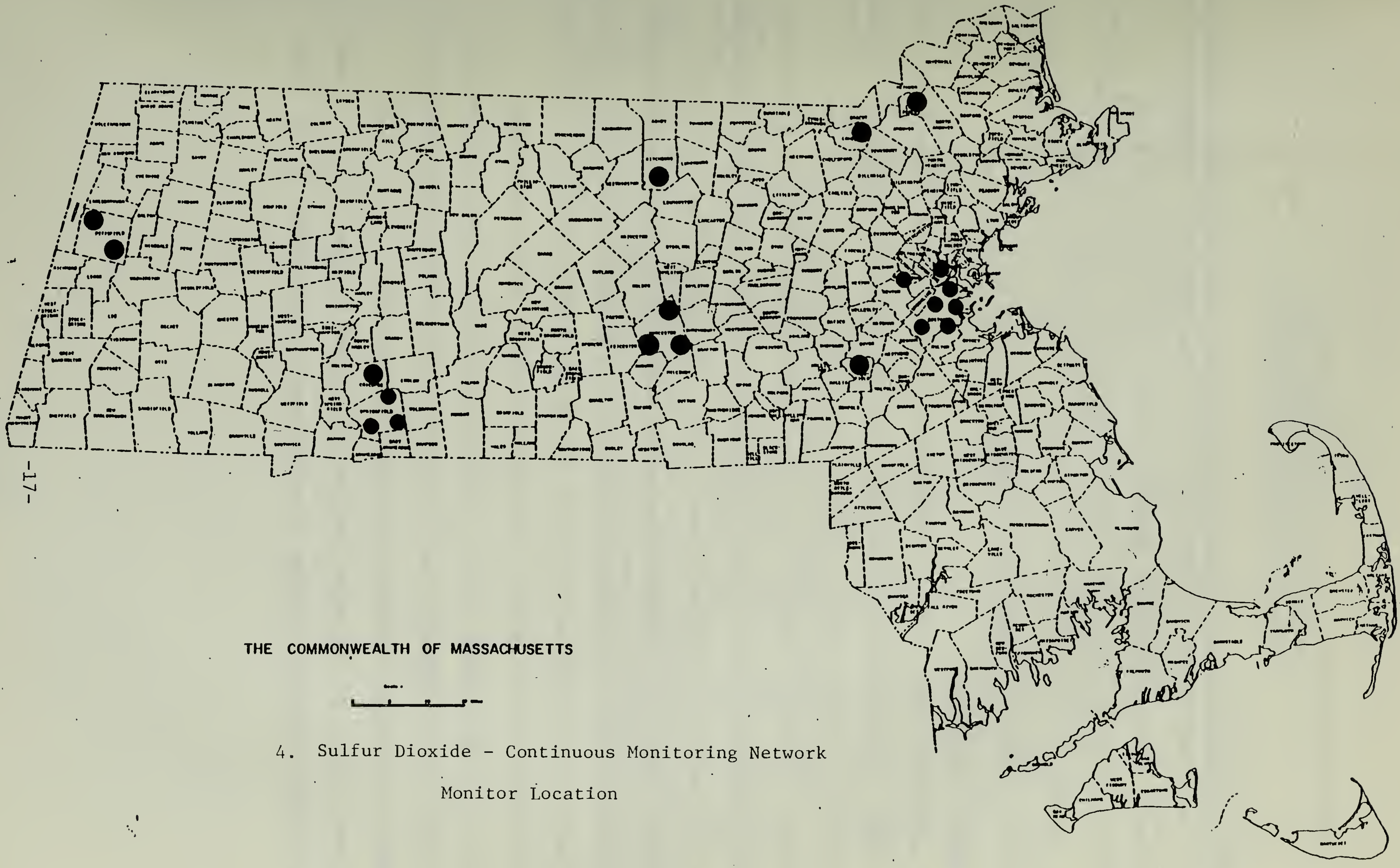
SO_2 units: ug/m^3

City	Saroad #	Instrument Method	Number of Hourly obs.	Annual Arith. Mean	Max. 24 hr obs.	2nd Max 24 hr obs.	Max. 3 hr obs.	2nd Max 3 hr obs.	Max 1 hr obs.	2nd max 1 hr. obs.
BERKSHIRE AIR QUALITY CONTROL REGION (117)										
Pittsfield	1800-005	14	4388**	*	114	90	262	205	315	288
Pittsfield	1800-007	20	1029**	*	68	50	118	105	197	171
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)										
Fitchburg	0620-003	14	7947	17	76	58	132	118	189	157
Worcester	2640-017	14	4291**	*	109	108	218	192	288	236
Worcester	2640-019	14	7805	22	109	102	159	148	288	236
Worcester	2640-020	14	6215**	25	106	98	201	166	236	210
MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)										
Lawrence	1000-005	14	8227	26	109	106	214	198	299	268
Lowell	1080-007	20	7690	26	123	111	279	183	304	288
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)										
Boston	0240-002	14	8137	47	132	123	393	314	563	563
Boston	0240-015	14	8106	41	129	112	262	259	412	325
Boston	0240-021	14	6341**	37	128	116	364	281	655	577
Boston	0240-023	14	7507	27	117	107	271	249	320	312
Boston	0240-026	20	3254**	*	96	60	179	178	364	265
Medfield	1210-001	14	6821	20	86	78	122	118	173	144
Somerville	2100-003	14	4634**	*	114	113	275	249	419	393
Watertown	2380-005	20	8020	25	97	192	186	176	330	268
PIONEER VALLEY AIR QUALITY CONTROL REGION (042)										
Chicopee	0400-005	14	8322	26	107	105	227	223	472	315
Springfield	2160-009	14	8031	31	170	136	429	393	524	524
Springfield	2160-014	14	4518**	*	73	68	162	153	236	236
Springfield	2160-015	14	7878	27	133	127	223	210	629	315
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)										
Fairhaven	0570-002	20	2871**	*	72	66	156	114	189	189
Fall River	0580-004	20	7999	24	82	79	219	200	524	393

*Annual Arithmetic Mean could not be determined due to insufficient sample size.

** When total observations are less than 6,250, sample size is insufficient to represent sound data results. Sulfur dioxide data are collected throughout the year; 100% data capture during this period represents 8,760 hourly observations.

FIGURE 2: CONTINUOUS AIR SAMPLING NETWORK



4. Sulfur Dioxide - Continuous Monitoring Network

Monitor Location

B. CARBON MONOXIDE (CO)

1. Sampling Method

DAQC uses non-dispersive infrared (NDIR) analyzers for carbon monoxide detection. These analyzers employ a short cell NDIR detection principle coupled with water vapor subtraction. This methodology meets equivalency requirements published by the U.S. Environmental Protection Agency in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

DAQC operated nine CO monitors in 1982 -- an increase of two monitors from 1981. There was one violation of the one-hour standard in Boston at the Essex Street monitor (0240-022); a value of 42 mg/m_3 was recorded. The Essex Street site also recorded the highest eight-hour average concentrations. Twenty violations of the eight-hour standard were recorded at the Essex Street site. The only other site which violated eight-hour standard was also in Boston at the Kneeland Street monitor. In 1981, there were 29 total violations of the eight-hour standard, 24 of these occurred at the Essex Street monitor (0240-015). The reduction of violations occurring at Essex Street does not indicate an improvement in air quality at this hot spot, since the first and second highest values for both the one-hour and eight-hour standards increased dramatically in 1982 (see Table 6). DEQE believes that this increase can be attributed to the idling of heavy construction equipment which services new construction in the area.

TABLE 6

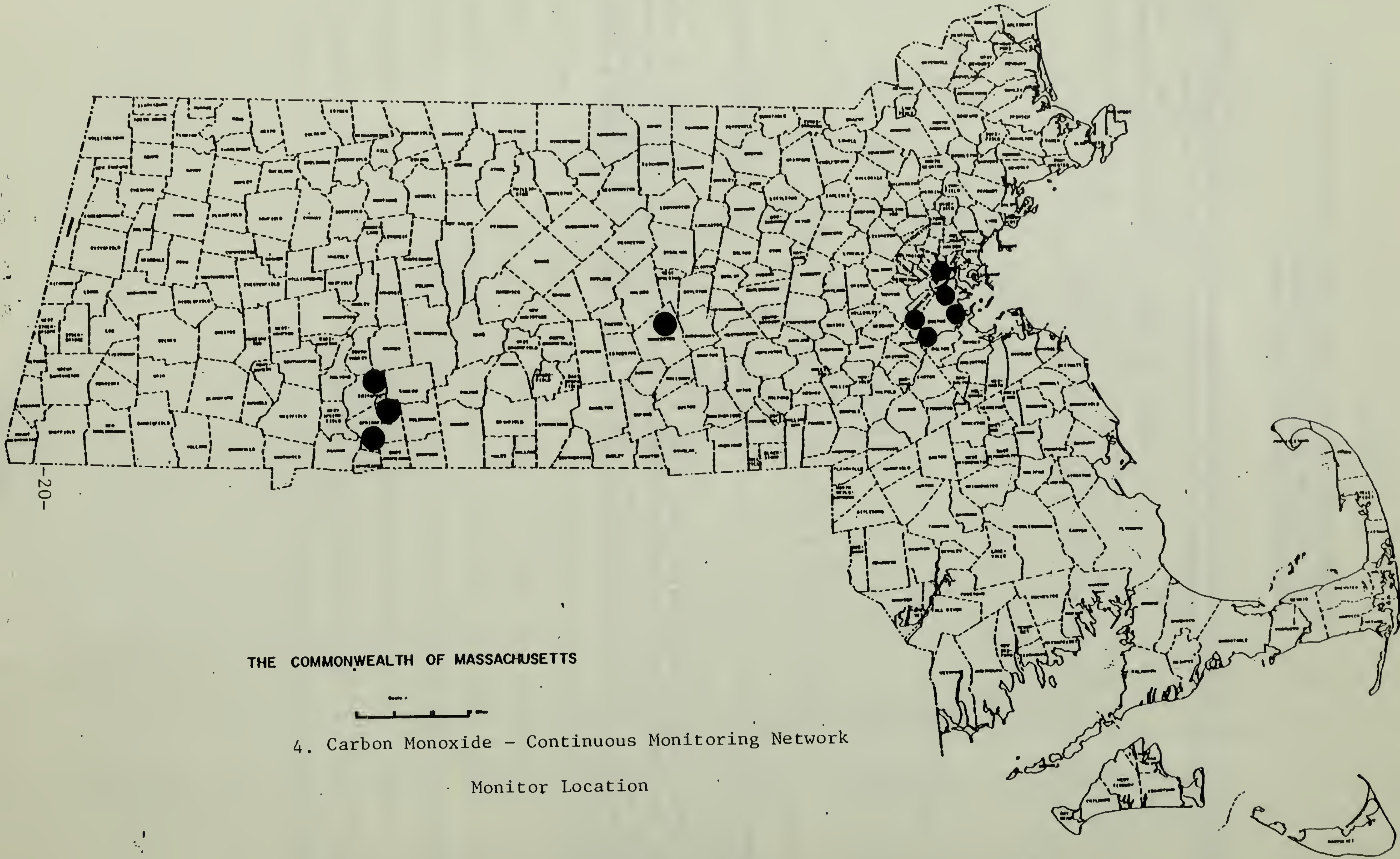
3. 1982 CARBON MONOXIDE SUMMARY

CO Units: mg/m^3

City	Saroad #	Instrument Method	# of obs.	Max. 1 hr. obs.	2nd Max 1 hr	Max 8 hr obs.	2nd Max 8 hr	# of 8 hr. averages above 10
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)								
Worcester	2640-020	11	7598	17	17	10	9	0
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)								
Boston	0240-002	11	7769	18	17	12	10	1
Boston	0240-015	11	2843**	17	15	13	11	2
Boston	0240-021	11	7922	17	17	11	10	1
Boston	0240-022	11	5195**	48	44	30	25	20
Somerville	2210-003	11	4138**	13	9	5	4	0
PIONEER VALLEY AIR QUALITY CONTROL REGION (042)								
Chicopee	0400-005	11	2866**	12	10	8	8	0
Springfield	2160-007	11	7234	20	16	12	10	1
Springfield	2160-014	11	4349**	10	9	6	5	0

** When total observations are less than 6,570, the sample cannot be guaranteed to contain the actual maximum concentration value for the year. An observation is a single hourly reading at a site. Carbon monoxide data are collected throughout the year; 100% data capture during this period represents 8,760 hourly observations.

FIGURE 3: CONTINUOUS AIR SAMPLING NETWORK



THE COMMONWEALTH OF MASSACHUSETTS

4. Carbon Monoxide - Continuous Monitoring Network

● Monitor Location

C. OZONE (O_3)

1. Sampling Method

The chemiluminescent detection principle and the ultraviolet photometric analyzer method are used in the continuous measurement for ozone. In the chemiluminescent method, the ozone reacts chemically with ethylene gas emitting light. The intensity of the emitted light is proportional to the amount of ambient ozone. In the ultraviolet method, the ultraviolet photometer gauges ozone concentrations by measuring the attenuation of light from ozone in the adsorption cell at a wave length of 254 namometers. The concentration of ozone is directly related to the magnitude of attenuation. This methodology meets equivalency requirements published by the U.S. Environmental Protection Agency in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

DAQC operated 13 stations for ozone in 1982, two less than in 1981. Six stations violated the .120 parts per million standard, and every AQCR except for the Berkshire AQCR recorded at least one exceedance of the standard. The ozone standard, however, was only violated in the Merrimack Valley, Metropolitan Boston, and Pioneer Valley AQCRs. In 1981, 25 violations were recorded statewide and in 1982, 24 violations were recorded. A statistical comparison of the violations occurring in 1981 and 1982 indicated no significant change in the number of exceedances or violations. A comparison of the second highest values recorded at the 12 monitors operating in both 1981 and 1982 found that at nine sites values increased and at three sites values decreased.

TABLE 7

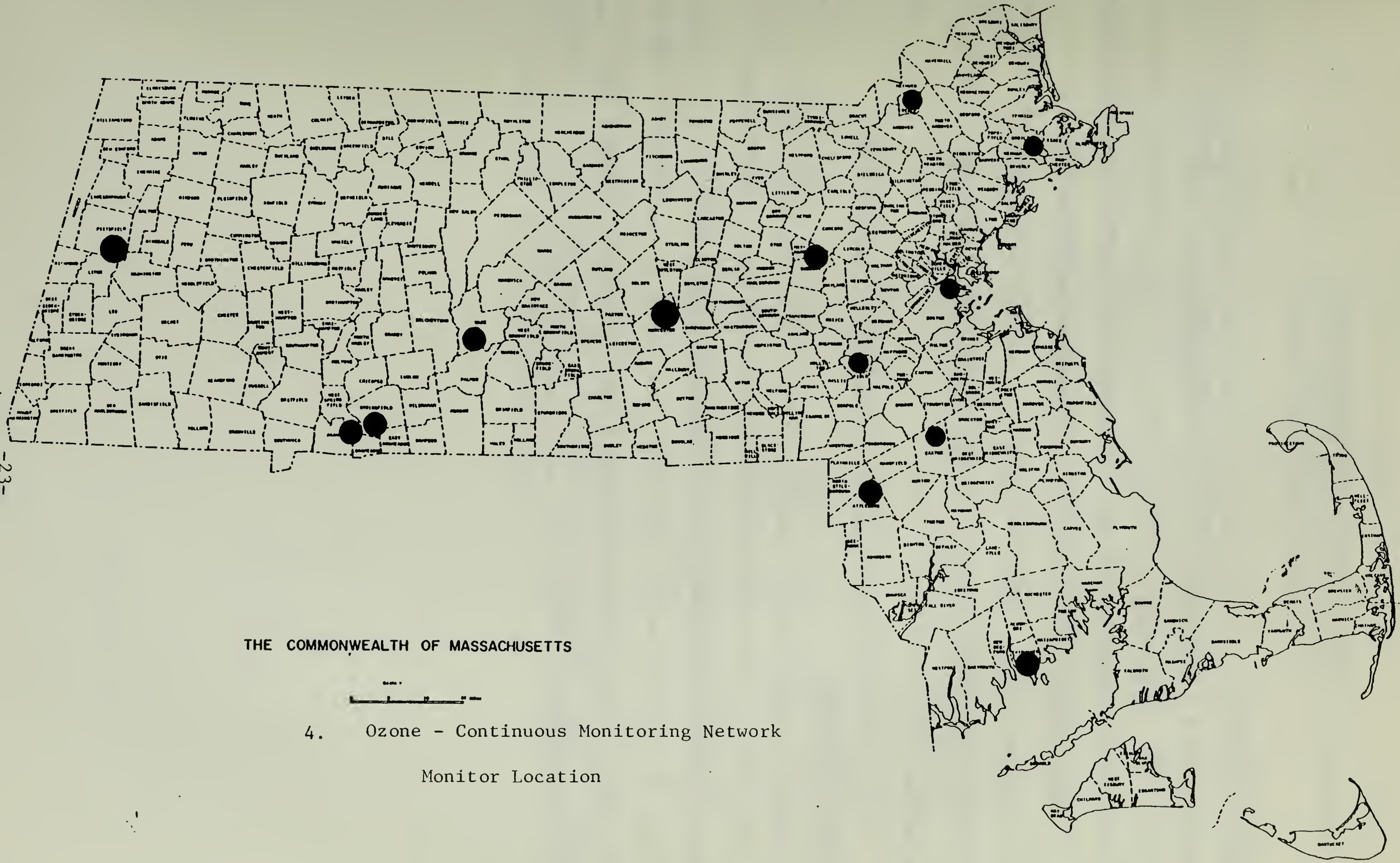
3. 1982 OZONE SUMMARY

O_3 units = ppm

City	Saroad #	Instrument Method	# of obs.	Max. 1 hr obs.	2nd Max 1 hr obs.	3rd Max 1 hr obs.	Values > .125 measured
BERKSHIRE AIR POLLUTION CONTROL REGION (117)							
Pittsfield	1800-005	11	2862**	.117	.115	.105	0
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)							
Worcester	2640-019	11	4638	.125	.110	.105	1
MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)							
Lawrence	1000-005	11	4257	.127	.158	.157	5
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)							
Boston	0240-021	11	8000	.145	.117	.110	1
Easton	0535-001	11	4762	.151	.150	.111	2
Hamilton	0795-001	11	3618**	.165	.156	.125	3
Medfield	1210-001	11	4389	.127	.121	.121	1
Sudbury	2196-001	11	4553	.153	.147	.138	13
PIONEER VALLEY AIR POLLUTION CONTROL REGION (042)							
Agawam	0030-003	11	4579	.130	.122	.110	11
Springfield	2160-014	11	7823	.160	.155	.137	3
Ware	2360-001	11	4663	.165	.162	.145	4
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)							
Attleboro	0120-002	11	628**	.063	.055	.047	0
Fairhaven	0570-002	11	1227**	.122	.110	.105	1

** When total observations are less than 3,852, the sample cannot be guarante to contain the actual maximum concentration value for the year. An observatio is a single hourly reading at a site; 100% data capture during the 4/1 to 10/3 ozone season represents 5,136 observations at each monitor.

FIGURE 4: CONTINUOUS AIR SAMPLING NETWORK


THE COMMONWEALTH OF MASSACHUSETTS
4. Ozone - Continuous Monitoring Network
Monitor Location

D. NITROGEN DIOXIDE (NO_2)

1. Sampling Method

Nitrogen dioxide is measured by the chemiluminescent detection principle. In this method, nitric oxide (NO) and oxides of nitrogen (NO_x) are reacted with ozone and the resultant chemical products emit light. The intensity of this light is proportional to the concentrations of NO_2. This methodology meets equivalency requirements published by the U.S. Environmental Protection Agency in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

DAQC operated eight NO_2 monitoring sites in 1982, two more than in 1981. For the five monitors operating in both years, the annual arithmetic means decreased at three sites and increased at two sites. There was no statistically significant increase or decrease in the annual means. The highest arithmetic mean recorded (68) was well within the standard (100).

TABLE 8 8/10/84

3. 1982 NITROGEN DIOXIDE SUMMARY

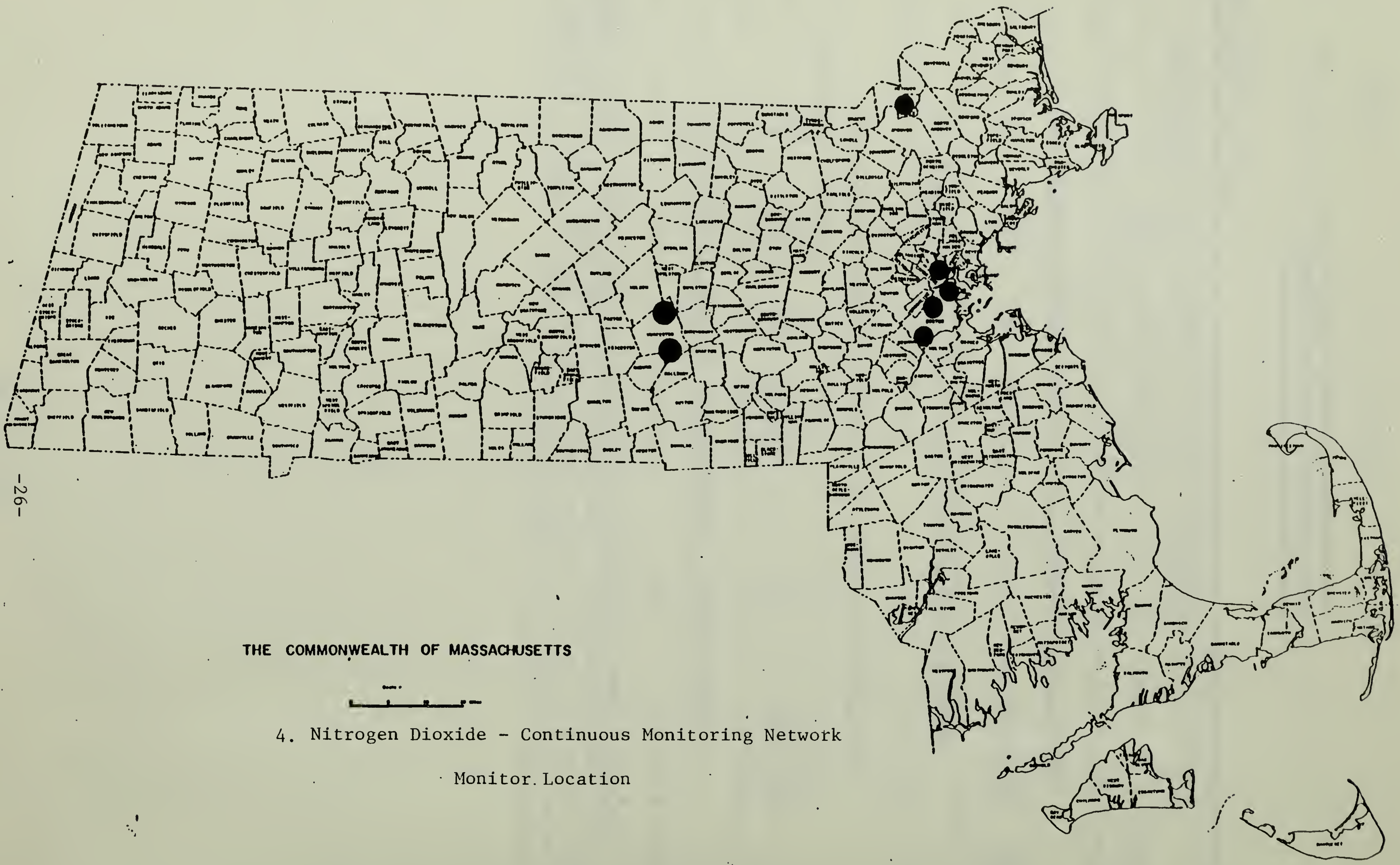
NO_2 units: ug/m^3

City	Saroad #	Instrument Method	Number of Hourly obs.	Max 1 hr obs.	2nd Max 1 hour obs.	Annual Arithmetic Mean
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)						
Worcester	2640-016	14	72**	122	160	*
Worcester	2640-019	14	7666	169	160	35
MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)						
Lawrence	1000-005	14	3385**	192	184	
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)						
Boston	0240-002	14	5491**	282	263	*
Boston	0240-021	14	7002	303	258	43
Boston	0240-026	14	3601**	433	395	*
Somerville	2100-003	14	3194**	235	207	*
PIONEER VALLEY AIR POLLUTION CONTROL REGION (042)						
Springfield	2160-014	14	6031**	178	160	*

*Annual Arithmetic Mean could not be determined due to insufficient sample size.

** When total observations are less than 6,570, the sample cannot be guaranteed to contain the actual maximum concentration value for the year. Nitrogen dioxide data are collected throughout the year; 100% data capture during this period represents 8,760 hourly observations.

FIGURE 5: CONTINUOUS AIR SAMPLING NETWORK



4. Nitrogen Dioxide - Continuous Monitoring Network

● Monitor Location

E. TOTAL SUSPENDED PARTICULATES (TSP)

1. Sampling Method

TSP measurements are routinely taken using the standard high volume air sampler method every sixth day. In this procedure, air is drawn through a pre-weighed 8"x10" fiberglass filter at the rate of 60 CFM for a period of 24 hours beginning at midnight. At the conclusion of the sampling, the filter is removed and transported to a laboratory for reweighing. The difference in weight in milligrams is divided by the volume of air passed through, giving a weight per unit volume result i.e., ug/m^3. Upon completion of the TSP (weight/unit volume) calculation, several other physical and chemical tests can be performed upon the collected sample. This methodology meets equivalency requirements published by the U.S. Environmental Protection Agency in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

In 1982, there were 26 state-operated TSP monitors which collected 1,700 samples, one less monitor than in 1981. There was only one exceedance of the 24-hour standard occurring at the Columbus Street Fire Station in Boston's Back Bay (0240-024). The annual geometric mean at this site was 71 ug/m_3, the highest in the Commonwealth. Construction in this area probably caused this high value.

Of the 22 sites operating in both 1981 and 1982 with 40 or more samples, the geometric means at 18 sites decreased, at three sites increased and at one site remained the same. A Wilcoxon Signed Rank test on the annual means found that there was a stastically significant reduction in TSP.

TABLE 9

3. 1982 TOTAL SUSPENDED PARTICULATES SUMMARY

TSP units: ug/m^3

City	Saroad #	Number of Obs.	Minimum Obs.	1st Max Obs.	2nd Max Obs.	3rd Max Obs	Annual Arith. Mean	Annu Geo. Mear
BERKSHIRE AIR QUALITY CONTROL REGION (117)								
Pittsfield	1800-006	52	11	151	149	94	51	45
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)								
Fitchburg	0620-006	15**	25	118	117	111	*	*
Gardner	0720-003	55	12	144	67	66	38	34
Warren	2372-001	47	11	49	47	45	27	25
Worcester	2640-013	53	12	99	98	93	45	41
Worcester	2640-016	140	14	142	127	123	54	49
Worcester	2640-018	43	18	132	124	84	51	47
MERRIMACK VALLEY AIR QUALITY CONTROL REGION (121)								
Lawrence	1000-003	137	7	142	111	98	41	36
Lawrence	1000-005	62	13	104	102	94	43	39
Lowell	1080-006	54	18	126	125	99	55	49
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)								
Boston	0240-012	143	16	129	113	103	57	54
Boston	0240-013	50	25	97	88	88	48	45
Boston	0240-024	54	27	322	176	145	80	71
Brockton	0320-003	43	11	84	84	81	42	39
Chelsea	0380-002	61	14	118	104	99	54	50
Medfield	1210-001	54	10	61	56	55	30	28
Medford	1220-002	25**	21	104	93	89	*	*
Quincy	1880-007	58	17	90	75	74	44	40
Woburn	2620-002	51	20	95	95	80	44	41

*Annual Arithmetic Mean and Annual Geometric Mean could not be determined due t insufficient sample size.

**When total observations are less than 40, the sample cannot be guaranteed to contain the actual maximum concentration value for the year.

TABLE 9 (cont.)

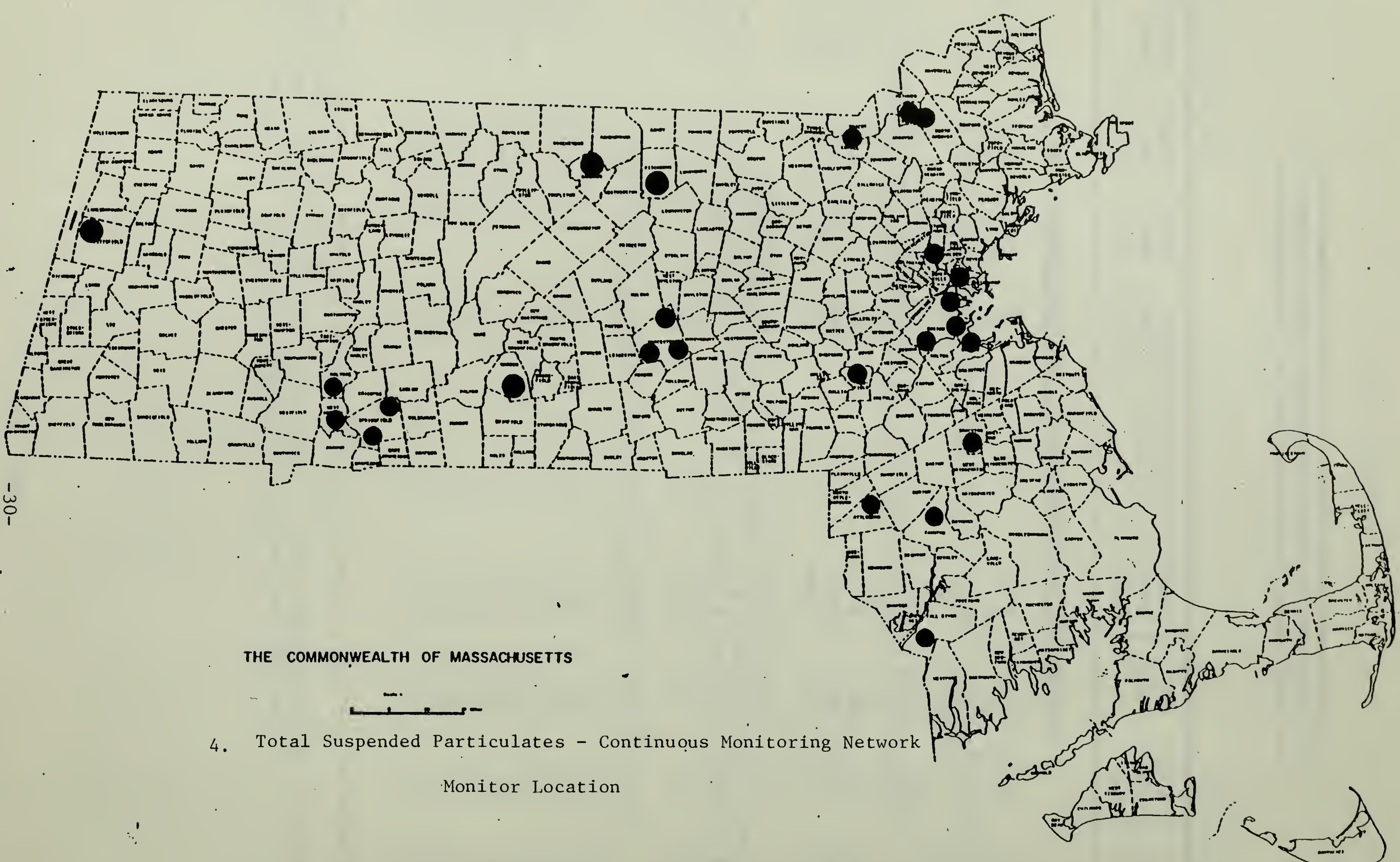
1982 TOTAL SUSPENDED PARTICULATES SUMMARY

TSP units: ug/m^3

City	Saroad #	Number of Obs.	Minimum Obs.	1st Max Obs.	2nd Max Obs.	3rd Max Obs	Arith. Mean	Geo. Mean
PIONEER VALLEY AIR QUALITY CONTROL REGION (042)								
Holyoke	0860-007	59	21	114	103	100	55	51
Springfield	2160-011	147	17	120	113	101	53	50
Springfield	2160--15	58	11	96	77	71	43	40
W. Sprngfld	2475-003	55	12	101	88	85	47	44
SOUTHEASTERN MASSACHUSETTS AIR QUALITY CONTROL REGION (120)								
Attleboro	0120-002	21**	26	98	76	70	*	*
Fall River	0580-001	139	15	140	138	131	52	47
Taunton	2240-001	25**	14	97	86	80	*	*

** When total observations are less than 40, the sample cannot be guaranteed to contain the actual maximum concentration value for the year.

FIGURE 6: CONTINUOUS AIR SAMPLING NETWORK



4. Total Suspended Particulates - Continuous Monitoring Network

Monitor Location

F. LEAD (Pb)

1. Sampling Method

Lead measurements are routinely taken using the standard high volume air sampler method every sixth day. In this procedure, air is drawn through a pre-weighed 8"x10" fiberglass filter at the rate of 60 CFM for a period of 24 hours beginning at midnight. At the conclusion of the sampling, the filter is removed and transported to a laboratory for reweighing. This analysis continues with the filter cut and placed in a nitric acid bath. The solution is then passed through an atomic absorption analyzer. Upon completion of the lead (weight/unit volume) calculation, several other physical and chemical tests can be performed upon the collected sample. This methodology meets equivalency requirements published by the U.S. Environmental Protection Agency in Part 58, 40 CFR, May 10, 1979.

2. Summary of Data

In 1982, there were six state-operated lead monitors which collected 243 samples. There were no recorded exceedances of the three-month standard.

TABLE 10

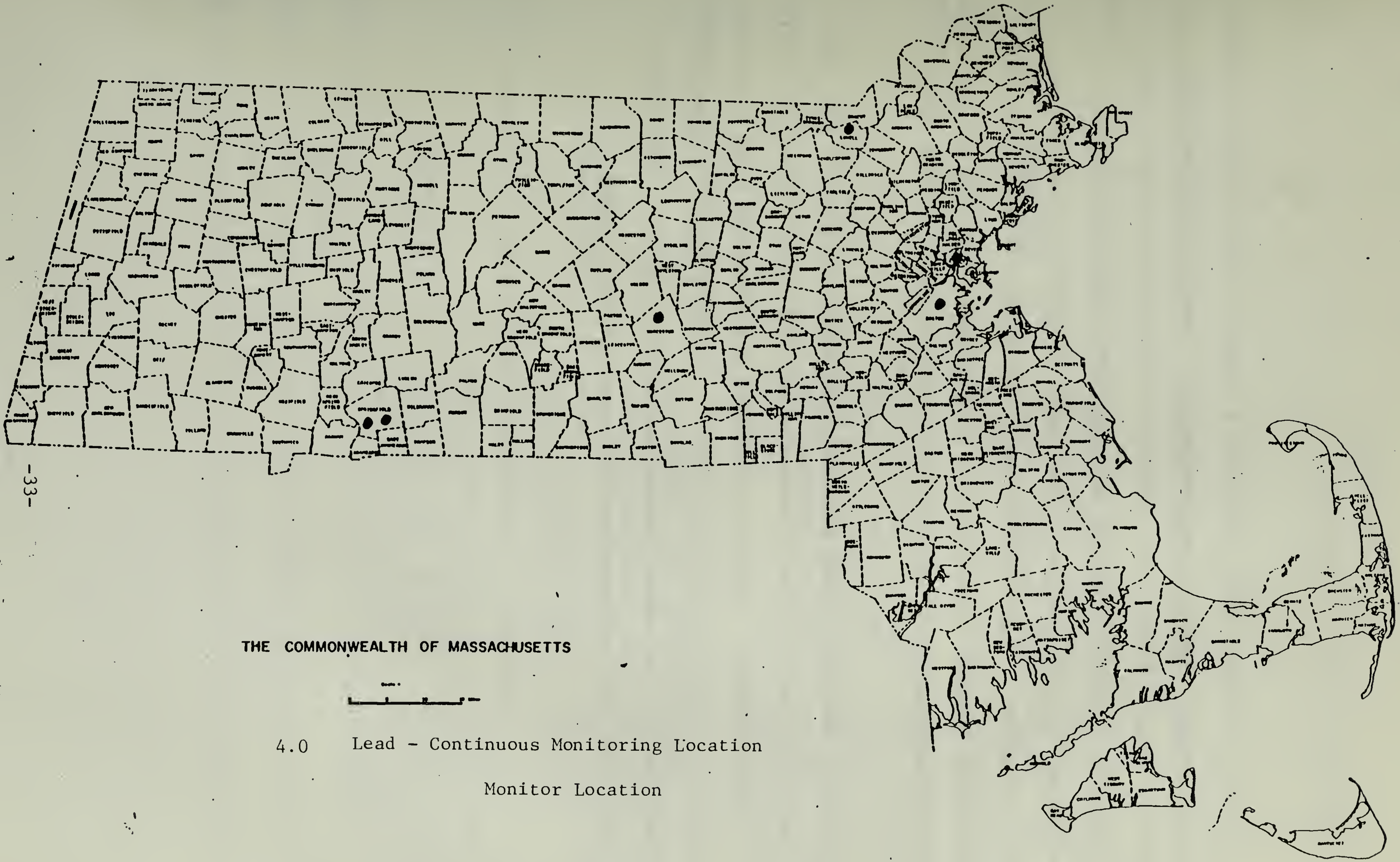
3. 1982 LEAD SUMMARY

Pb units: ug/m3

City	Saroad #	Instrument Method	Number of Hourly obs.	1st Max obs.	2nd Max obs.	Arithmetic Mean 1st	2nd	3rd	4th
CENTRAL MASSACHUSETTS AIR QUALITY CONTROL REGION (118)									
Worcester	2640-016	92	30**	0.76	0.60			0.31	0.41
MERRIMACK VALLEY AIR POLLUTION CONTROL REGION (121)									
Lowell	1080-006	92	28**	1.10	1.06			0.52	0.53
METROPOLITAN BOSTON AIR QUALITY CONTROL REGION (119)									
Boston	0240-002	92	48	1.62	1.60	0.88	0.79	1.08	0.85
Chelsea	0380-002	92	58	1.44	0.93	0.54	0.33	0.46	0.42
PIONEER VALLEY AIR POLLUTION CONTROL REGION (042)									
Springfield	2160-007	92	20**	2.40	2.30			1.07	1.19
Springfield	2160-011	92	59	1.64	1.41	0.60	0.36	0.54	0.67

** When total observations are less than 40, the sample cannot be guaranteed t contain the actual maximum concentration value for the year.

FIGURE 7: CONTINUOUS AIR SAMPLING NETWORK



4.0 Lead - Continuous Monitoring Location

Monitor Location

G. POLLUTANT STANDARD INDEX (PSI)

The Pollutant Standard Index provides a simple, uniform way to report concentrations of ozone -- the predominant form of photochemical oxidants or smog. Through its statewide ozone monitoring network, DAQC evaluates the previous day's ozone level and predicts the following day's ozone concentration based on the analysis and on weather forecasts. DAQC reports ozone PSI values daily during the months of May through September for three areas: Eastern, Central, and Western Massachusetts.

A statistical analysis using the Chi-Square test indicated that the only area with a significant change in the number of unhealthful days was the Eastern Region, where an increase was observed over the number of unhealthful days reported in 1981. The number of unhealthful days decreased in both the Central and Western Regions from 1981 to 1982, although this decrease was not statistically significant.

TABLE 11

Index Value	PSI Descriptor	General Health Effects	Cautionary Statements
500			
	hazardous	Premature death of ill and elderly. Healthy people will experience adverse symptoms that affect their normal activity.	All persons should remain indoors, keeping windows and doors closed. All persons should minimize physical exertion and avoid traffic.
400			
	hazardous	Premature onset of certain diseases in addition to significant aggravation of symptoms and decreased exercise tolerance in healthy persons.	Elderly and persons with existing respiratory diseases should stay indoors and avoid physical exertion. General population should avoid physical activity.
300			
	very unhealthful	Significant aggravation of symptoms and decreased exercised tolerance in persons with heart or lung disease with widespread symptoms in the healthy population.	Elderly and persons with existing heart or lung disease should stay indoors and avoid physical activity.
200			
	unhealthful	Mild aggravation of symptoms in susceptible persons, with irritation symptoms in the healthy population.	Persons with existing heart or respiratory ailments should reduce physical exertion and outdoor activity.
100			
	moderate		
50			
	good		
0			

TABLE 12

1982 POLLUTANT STANDARD INDEX

		Eastern	Central	Western
APRIL	Good	14	20	21
	Moderate	15	10	9
	Unhealthful	1	0	0
MAY	Good	12	12	17
	Moderate	18	19	14
	Unhealthful	1	0	0
JUNE	Good	16	18	13
	Moderate	14	12	16
	Unhealthful	0	0	1
JULY	Good	8	10	7
	Moderate	17	16	20
	Unhealthful	6	5	4
AUGUST	Good	15	15	18
	Moderate	16	16	13
	Unhealthful	0	0	0
SEPTEMBER	Good	16	21	21
	Moderate	13	9	9
	Unhealthful	1	0	0

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